



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$\therefore \text{Distance of focus from center} = \sqrt{\frac{A-B}{m}}.$$

Let θ = the angle the principal axes make with the sides. then if u, v be the coördinates of the focus, we easily get

$$u = \sqrt{\frac{A-B}{m}} \cos \theta, \quad v = \sqrt{\frac{A-B}{m}} \sin \theta.$$

$$\therefore u^2 + v^2 = \frac{A-B}{m}, \quad u^2 - v^2 = \frac{A-B}{m} \cos 2\theta.$$

From problem 94, solution on page 48, Vol. VII, No. 2, we get

$$u^2 + v^2 = \frac{1}{1^2} \sqrt{[a^4 + b^4 + 2a^2b^2 \cos 2\beta]}.$$

$$u^2 - v^2 = \frac{1}{1^2} (a^2 + b^2 \cos 2\beta).$$

Eliminating $\cos 2\beta$ we get

$$144(u^2 + v^2)^2 = 24a^2(u^2 - v^2) - a^4 + b^4.$$

Let $u = r \cos \varphi$, $v = r \sin \varphi$.

$$\therefore 144r^4 = 24a^2r^2 \cos 2\varphi - a^4 + b^4, \text{ or } r^4 = \frac{1}{3}a^2r^2 \cos 2\varphi - a^4/144 + b^4/144.$$

If $a = b$, $r^2 = \frac{1}{3}a^2 \cos 2\varphi$.

104. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pa.

From a locomotive and tender standing still on a bridge, the pressure on the bridge is $p_1 = 80$ tons. The track is supposed to be straight and practically horizontal. Had the locomotive and tender been running at the rate of $r = 60$ miles an hour, how many tons would the pressure on the bridge have been?

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$$p_1 = 80 \text{ tons} = W = mg.$$

Both m and g are constant.

\therefore The pressure is the same, 80 tons, no matter what the velocity.

DIOPHANTINE ANALYSIS.

83. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Find three numbers in arithmetical progression whose sum is a square and cube.

I. Solution by J. W. YOUNG, Cornell University, Ithica, N. Y.; B. L. REMICK, Bradley Polytechnic Institute, Peoria, Ill.; and ALOIS F. KOVARIK, Decorah Institute, Decorah, Ia.

A number which is a square and a cube is a sixth-power.

Also three numbers in arithmetical progression may be represented by

$$a-d, a, a+d; \text{ whose sum is } 3a.$$

These considerations lead at once to the following expressions for the required numbers: 3^5x^6-d , 3^5x^6 , 3^5x^6+d , where x , d , are any numbers.

The sum is evidently $(3x)^6=[(3x)^2]^3=[(3x)^3]^2$.

As an example we may take $x=1$, $d=100$.

$$143, 243, 343, \text{ whose sum } = 729 = 27^2 = 9^3.$$

II. Solution by the PROPOSER.

Let $\frac{1}{3}(x-y)^2$, $\frac{1}{3}(x^2+y^2)$, $\frac{1}{3}(x+y)^2$ be the three numbers.

Their sum is x^2+y^2 .

Let $x^2+y^2=a^6m^6$. Let $x=m^2-n^2$, $y=2mn$.

$$\therefore x^2+y^2=(m^2+n^2)^2=a^6m^6.$$

$$\therefore m^2+n^2=a^3m^3.$$

Let $n=pm$.

$$\therefore m^2(1+p^2)=a^3m^3.$$

$$\therefore m=\frac{1+p^2}{a^3}, \quad n=\frac{p(1+p^2)}{a^3}.$$

$$x=\frac{(1+p^2)^2(1-p^2)}{a^6}, \quad y=\frac{2p(1+p^2)^2}{a^6}, \quad x^2+y^2=\frac{(1+p^2)^6}{a^{12}}.$$

\therefore The numbers are

$$\frac{1}{3}\left(\frac{(1+p^2)^2(1-2p-p^2)}{a^6}\right), \quad \frac{1}{3}\left(\frac{(1+p^2)^6}{a^{12}}\right), \quad \frac{1}{3}\left(\frac{(1+p^2)^2(1+2p-p^2)}{a^6}\right).$$

Also solved by CHAS. C. CROSS, JOSIAH H. DRUMMOND, M. A. GRUBER, J. SCHEFFER, and ELMER SCHUYLER.

84. Proposed by the late SYLVESTER ROBINS, North Branch Depot, N. J.

The n th term of an infinite series of "nests" contains all the prime, integral, rational parallelopipeds that have 3^n for their solid diagonals. It is required to determine the general expression for N =the number of such solids in n th term, and to exhibit the dimensions of all the "eggs" in the first six nests.

Solution by M. A. GRUBER, A. M., War Department, Washington, D. C.

In parallelopipeds the square of the solid diagonal equals the sum of the squares of the three dimensions (length, breadth, and height). Whence, $(3^n)^2$ =the sum of three squares.

When $(3^n)^2$ =the sum of three *integral* squares, I have found, by inspection, that the entire number of sets of three squares is, in terms of n , $\frac{3^n+2n-1}{4}$, of which $\frac{3^{n-1}+1}{2}$ are prime sets, and $\frac{3^{n-1}+2n-3}{4}$ multiple sets.

$$\therefore \text{According to the problem, } n=\frac{3^{n-1}+1}{2}.$$

In *prime* sets of the sum of three squares equal to a square, it will be observed that two of the three squares are even and the other odd.

By means of an extensive table containing the odd numbers that are equal